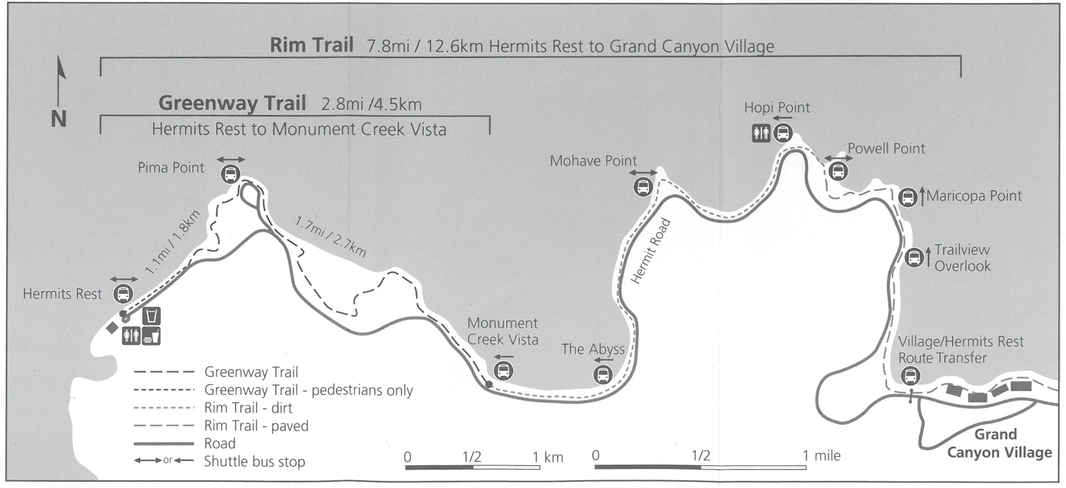
Plants Living on the Edge

Grand Canyon National Park

Walk the Hermit Road portion of the Greenway Trail to learn about the South Rim's plant communities and how they thrive in this challenging environment.

This section of the Greenway Trail starts at Monument Creek Vista and ends at Hermits Rest, a distance of 2.8 miles/4.5 km. The paved trail is relatively level with some slight up and downhill sections. Walk along the entire trail or only a portion of it, picking up the free shuttle bus at Pima Point along the way. Enjoy the quiet overlooks and rest on benches along the trail. Water, snacks, and restrooms are available only at Hermits Rest.

Carry water and snacks and wear clothing appropriate for the weather. The exposed rim becomes hot in the summer and quite cold with sharp winds in the winter. Be prepared and enjoy your learning adventure against the backdrop of Grand Canyon.

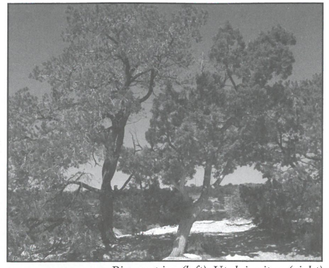


Rim Environment

The arid environment of the South Rim poses a number of challenges for the plants living here. The rim averages only 16 inches/41 cm of rain a year, which varies widely from year to year. Periods of drought are common. Half of the precipitation falls as winter snow, when many plants are dormant and cannot use the moisture. The other half arrives with summer monsoon storms starting in July. Huge thunderclouds build as the day heats up, often producing violent torrents of rain. Since much of the ground surface is rock, only a portion of the rainwater penetrates the soil while the rest rushes away. Fractures within the rocks draw water deep into the ground, below the roots of the plants.

The *rim effect* influences local environments. Warm, dry, summer air rising from the depths of the abyss spills over the rim, stunting trees that grow tall and stately just a few hundred feet back from the edge. Winter storms laden with snow and ice sweep across the canyon, blasting the plants close to the rim and exacting a toll on foliage and the next season's leaf and stem buds.

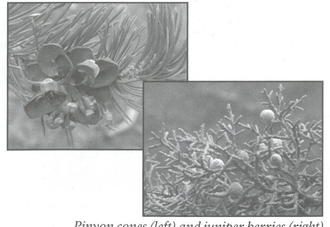
Pinyon-Juniper Community



Pinyon pine (left), Utah juniper (right)

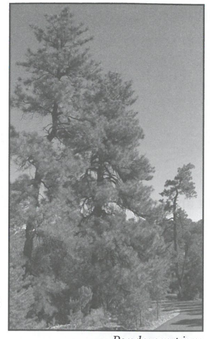
Woodlands dominated by pinyon pine and various species of juniper grow throughout the Southwest and dominate the vegetation along the edge of Grand Canyon's South Rim.

Pinyon pine is easily recognized by its dark bark, short, curved needles in groups of two, and small cones. The Utah juniper has shaggy bark, small scale-like needles, and light blue-green cones that look like, and are called, berries. A rich variety of shrubs, flowers, and grasses grow beneath these trees, comprising a complex, fascinating community.



Pinyon cones (left) and juniper berries (right)

Both pinyons and junipers illustrate adaptations to this dry environment. Short, stout trees better withstand the strong winds battering the rim. Small, wax-coated needles use less water. Evergreen trees retain their needles for years and do not expend precious water and energy replacing all their foliage each year. These long-lived trees grow very slowly. Even the smaller trees are decades old and can survive more than 600 years.



Ponderosa pines

Temperature increases and rainfall becomes more scarce as you descend into the canyon. Desert plants replace pinyons and junipers. Biologist C. Hart Merriam documented this pattern of changing plant and animal communities with changes in elevation more that 100 years ago. He introduced the concept of *life zones*—broad bands of plant and animal species that could be associated with certain latitudes, elevations, and exposures.

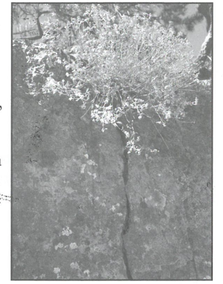
At elevations higher than those found on most of the South Rim, ponderosa pines replace the pinyon-juniper community. At even higher elevations on the North Rim, Engelmann spruce, subalpine fir, and aspen replace the ponderosa pine community.

Microhabitats

Within each landscape are microhabitats, areas with conditions ideal for a plant or community that otherwise would not be able to flourish.

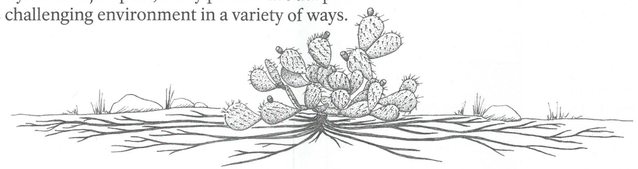
As you walk along the Greenway Trail west of Monument Creek Vista and leave the canyon's rim, notice several ponderosa pines towering along the trail. Ponderosas have tall, straight trunks and long needles. Generally found at higher elevations than pinyons and junipers, here they grow together. Why would that be? First, by leaving the rim, you are leaving the rim effect, the strong winds and hotter air temperatures that would prevent a ponderosa from living right along the rim. Also, the trail traverses a drainage that holds more moisture below the ground surface than other areas, providing ponderosas sufficient moisture to live. You have encountered a microhabitat suitable for ponderosas.

Microhabitats can be much smaller in scale, such as a crack in the rock. While at first glance a crack seems like an impossible habitat, it is actually quite favorable. Cracks trap and hold soil and moisture, giving plants growing within them a better habitat than available nearby.



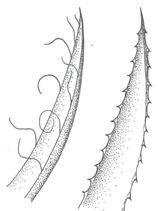
Adaptations to the Environment

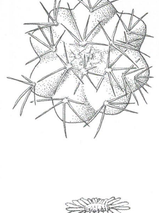
Like pinyons and junipers, many plants have adapted to this challenging environment in a variety of ways.



Prickly pear cactus roots extend well beyond the plant and spread close to the surface, poised to rapidly absorb as much moisture as possible during short-lived monsoon storms. Cacti store large amounts of water for use during droughts.

Yucca (*left*) and agave (*right*) grow thick, waxy leaves that store moisture. Although they have very different leaf edges, both plants form as a rosette of tough, spine-tipped leaves.





Claret-cup cacti have fluted, accordion-like stems that expand for maximum water storage.

Many plants—cliffrose (*left above*), Mormon tea (*middle*), and sagebrush (*right*)—have small leaves to minimize water loss. The green stems of Mormon tea take on the food-producing function of leaves. Silvery sagebrush leaves reflect the sun's rays, keeping them cooler.

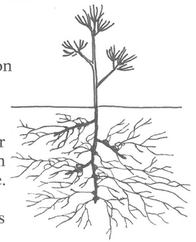
Tiny hairs cover the stems and foliage of Navajo fleabane (*left*) and cheatgrass (*right*) contributing to the plants' light color and helping to reduce moisture loss.

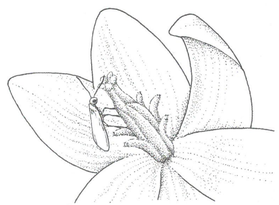
Interactions with other Plants and Animals

Plants often develop symbiotic relationships with animals, benefitting both the plant and the animal. You may be surprised by the complexity of these interrelationships and the dependency of the participants on each other.

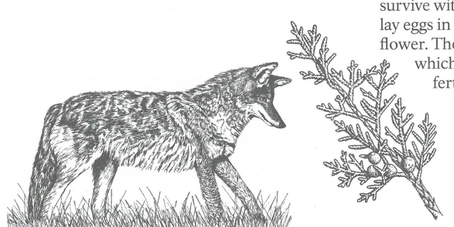
Watch for scrub jays collecting pinyon nuts ripening in the fall. Jays cache the seeds in the ground away from the tree. In the spring they remember where they left the nuts and return to eat them. Seeds the birds do not retrieve are left to sprout as future trees.

Fungi form an elaborate transfer system with pinyon pine roots. The fungi grow thin, root-like *hyphae* that transfer water and minerals from the soil to the tree. The tree, in turn, contributes sugars to the fungi. With this association, tree roots need to grow less extensively, while fungal hyphae (the thin lines) extend to areas far beyond the roots.





Yucca plants and yucca moths cannot survive without each other. Adult moths lay eggs in a flower, then pollinate the same flower. The larvae eat only the mature seeds, which developed because the moth fertilized the flower. Larvae do not eat all the seeds, leaving the yucca sufficient to reproduce.

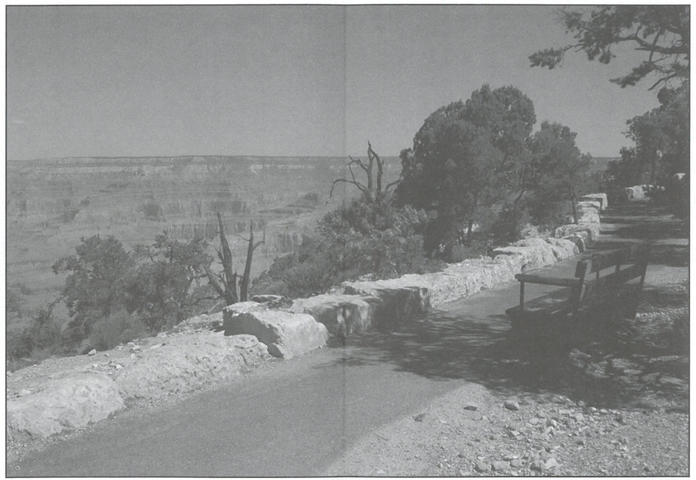


Coyotes and birds eat juniper berries and leave the seeds in their droppings. The undigested seeds may germinate at some distance from the parent tree.

Past, Present, and Future

Today the pinyon-juniper community prospers along the South Rim and partway down the canyon, but its range has changed through the millennia. During the most recent ice age (35,000–11,000 years ago), when the region was cooler and moister, pinyon-juniper communities spread to the bottom of the canyon. Scientists determined this from plant evidence left in caves and alcoves by packrats. As global climate continues to warm, the pinyon-juniper habitat type may become established at higher elevations. Plants within this community may find the South Rim uninhabitable.

A healthy pinyon-juniper community consists of a large variety of plants that provide rich wildlife habitat. This important community needs to be protected and nurtured at Grand Canyon National Park and throughout the Southwest. Tree cutting, introduction of non-native plants, and overgrazing have degraded the community. The combination of recent droughts and insect infestations has killed many trees. We must work to preserve this vibrant collection of plants and animals so that it continues to be a widespread component of the Southwestern landscape.



National Park Service
U.S. Department of the Interior

Grand Canyon National Park
Arizona

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Along the Hermit Road Greenway Trail